TERRA
DYNAMICS INC
INJECTION WELL SERVICES - OIL & GAS CONSULTING

February 7, 2011 11-101

Mr. Brian Graves
U.S. Environmental Protection Agency
Allied Bank Tower at Fountain Place
1445 Ross Avenue
6WQ-SG
Dallas, Texas 75202-2733

Re: ExxonMobil Petition Reissuance Request

Dear Brian:

In response to the following deficiency,

3. In the first Notice of Deficiency, EPA cited scale problems for most Section 7 Plates in Volume I provided to present reissuance geology and modeling results together. ExxonMobil revised these Plates and submitted replacements in response to the deficiency with revised Plates being plotted on a 1" equals 6000' scale and the scale being correctly displayed. In reviewing the revised Plates to confirm the corrections, EPA notes that a small cumulative plotting scale error still exists on each Plate of generally between 300 and 500 feet in both the overall X and Y dimensions. ExxonMobil should review all of the Section 7 revised Plates, 7-1 through 7-23, and correct the slight cumulative scale error so that X and Y scale dimensions properly reflect the cumulative distances used on each Plate.

I reviewed the Plates and reprinted them to try to determine what the issue is. I have verified that depiction on my computer screen is correct with respect to scale, but there does appear to be a slight error introduced during reproduction. Our plotter rolls out the paper and uses an inkjet process to lay down the image ink as the plotter rolls out the paper. Without any other explanation for the small stretch, or small reduction, I am left to believe that either the mechanical process, or "shrink or expansion" which may occur as the damp ink is absorbed into the paper is the culprit. I will do my best to reproduce the subject Plates with the scale being as correct as possible.

As a possible solution, if I removed the statement in the legend which states (for example: 1" = 6,000') and replace it with a scale bar, would this be a reasonable solution. This will ensure that any shrinkage or stretch is carried over to the scale in the legend. I have prepared a draft of Plate 7-1, Plate 7-7, Plate 7-13 and Plate7-15 and have added a scale bar and removed the "Scale: 1" = 6,000'". If this solution seems reasonable, please let me know and I will edit and reprint the remaining Plates.

4616 WEST HOWARD LANE STE. 9-980 AUSTIN, TEXAS 78728 512-795-8183

Should you have any questions or comments, or require additional information concerning the enclosed documents, please do not hesitate to call me at (512) 795-8183. We will address any questions or comments you may have at that time.

Sincerely,

Terry D. Moody

Terry D. Moody, PG
Project Manager/Senior Geologist

TDM/tdm
Attachment

cc: Buddy Hand - ExxonMobil

RESPONSE TO
ExxonMobil
Agrifos Facility - Pasadena, Texas
WDW-397 and WDW-398 - 2009 Petition Reissuance
January 31, 2011 2nd Notice of Deficiency (Clean Up Items)

Background

ExxonMobil Corporation (ExxonMobil) received a no migration petition exemption on January 15, 2009, to operate a Class I hazardous waste well, WDW-397, to dispose of gypsum stack pond water from the Agrifos fertilizer plant facility. ExxonMobil is requesting a no migration petition reissuance to add a second newly drilled and completed Class I well, WDW-398 and increase injection volumes.

The existing exemption contains the following conditions:

- Cease injection into WDW-397 by December 31, 2020
- Defined Confining Zone: 4850' - 5347' kelly bushing depth (KB) for WDW-397
- Defined Injection Intervals: 5922' - 7272' KB for WDW-397 with an upper completion depth limit of 6200' KB
- Defined Injection Zone: 5347' - 7272' KB for WDW-397
- Specific gravity range of the waste stream: 1.00 to 1.05 g/cc inclusive at 68°F and 1 atmosphere with a reference temperature of 68 °F
- Cumulative volume injected into WDW-397 shall not exceed:
  (140 gpm)(1440 minutes/day)(number of days in that month) for the Frio D Sand
  (700 gpm)(1440 minutes/day)(number of days in that month) for the Frio E&F Sand
  (700 gpm)(1440 minutes/day)(number of days in that month) for the Frio A/B Sand
- Perform an annual flow profile survey in WDW-397 to confirm the flow distribution in the Frio D, E&F, and A/B Sands
- Approved waste codes: D002, D004, D005, D006, D007, D008, D009, D023, D024, D025, D030, and F039 (based on constituents in Table 6-3)

In the 2009 reissuance, ExxonMobil is requesting the following conditions:

- Cease injection into WDW-397 and WDW-398 by December 31, 2020
- Retain the same injection intervals as in the current petition, 5900' - 7250' below ground level (BGL) for both WDW-397 and WDW-398 with an upper completion depth limit of 6178' BGL
- Cumulative volume injected into WDW-397 and/or WDW-398 shall not exceed:
  (360 gpm)(1440 minutes/day)(number of days in that month) for the Frio D Sand
  (1200 gpm)(1440 minutes/day)(number of days in that month) for the Frio E&F Sand
  (1200 gpm)(1440 minutes/day)(number of days in that month) for the Frio A/B Sand
  (1200 gpm)(1440 minutes/day)(number of days in that month) for total volume into WDW-397 and/or WDW-398

- An annual flow profile survey to be run in both WDW-397 and WDW-398 to confirm that total flow distribution into the Frio D Sand does not exceed 360 gpm between the two wells
- Specific gravity range of the waste stream is 1.00 to 1.05 g/cc at 68°F and 14.7 psi with 68°F reference temperature
- Retain the same hazardous waste codes

<u>Section 4 – Geology and Hydrogeology</u>

1. In Section 4.2.6, Page 4-31, Volume I, the sentence at the start of the second paragraph includes the phrase "the from." ExxonMobil should complete or modify the phrase to clarify the sentence meaning.

   Response: The text on Page 4-31 has been revised and the phrase "the from" has been corrected. A revised Page 4-31 text page is provided with this response and is offered as a replacement for the existing text page.

<u>Section 7 – Modeling</u>

1. On Figure 7-1, a log cross section correlated across WDW-398, WDW-397, and WDW-147 and referenced in Section 7, Volume I, the footage indicator on log display for WDW-397 is unclear and appears to show a repeat of the interval from approximately 6260' to 6420' KB depth. The footage indicator for the log also appears distorted in general above 6260' KB. ExxonMobil should review the WDW-397 log as shown and make appropriate revisions to clarify its presentation in the figure.

   Response: Figure 7-1 was reprinted using a different printing protocol. The footage indicator errors are no longer distorted. A replacement Figure 7-1 is provided with this response.

2. In Section 7.3.3, Pages 7-21 through 7-23, Volume I, ExxonMobil references and provides summary tables of historical static bottom hole pressure data for the Frio Formation Injection Interval Frio D, E&F and A/B Sands in WDW-397, the Frio E&F Sand in WDW-147, and the Frio Formation Injection Interval Frio A/B Sand in WDW-319. The data in these tables are supported by pressure measurement data reports provided in Appendix C, Volume III. WDW-397's table appeared in error for October 2008 while WDW-319's table appeared in error for September 2000 and March 2002 when compared with Appendix C reports. WDW-147's table has multiple disagreements with Appendix C reports. ExxonMobil should review all three tables and reconcile all individual column values with their corresponding reports in Appendix C.

   Response: The subject tables of historical static BHP data provided on pages 7-21 through 7-23 have been edited and are now consistent with the corresponding data provided in Appendix C. Revised Section 7.0 text pages are provided with this response and are offered as replacement for the existing text pages.

3. In the first Notice of Deficiency, EPA cited scale problems for most Section 7 Plates in Volume I provided to present reissuance geology and modeling results together.

ExxonMobil revised these Plates and submitted replacements in response to the deficiency with revised Plates being plotted on a 1" equals 6000' scale and the scale being correctly displayed. In reviewing the revised Plates to confirm the corrections, EPA notes that a small cumulative plotting scale error still exists on each Plate of generally between 300 and 500 feet in both the overall X and Y dimensions. ExxonMobil should review all of the Section 7 revised Plates, 7-1 through 7-23, and correct the slight cumulative scale error so that X and Y scale dimensions properly reflect the cumulative distances used on each Plate.

Response: Revised Section 7.0 Plates are provided with this response. The subject scale error has been addressed. The revised plates are offered as replacement for the existing Section 7.0 plates.

<u>Section 8 – Area of Review</u>

1. In the first Notice of Deficiency, EPA requested more detailed maps of artificial penetrations (APs) around the Clinton Dome which encountered the 10,000 year demonstration low density buoyant plume. In response, ExxonMobil provided Plates 8-1B through 8-1D which provide coverage of APs to the west, northwest, and north of Plate 8-1A, a Clinton Dome Railroad Commission field Inset Map, as well as revised discussion in Section 8.2.3, Pages 8-10 through 8-13, Volume I, to address AP discrepancies between Plates 8-1A and 8-2, a Tobin base map centered on the Clinton Dome. ExxonMobil also includes a revised Plate 8-1, a master base map showing all APs within the path of the composite 10,000 year low and high density worst case plumes regardless of the sand horizon. ExxonMobil should address the following items concerning the various maps and AP discussion in Section 8:

   a. ExxonMobil discussed in its deficiency response that during the map revisions and expansion process it identified AP 231 as an additional AP to be documented within the low density plume path. ExxonMobil provided a plugging record for AP 231 in Appendix G, Volume IX and indicated that well was plugged with cement from total depth, 5500 feet, to surface. A review of the plugging record in Appendix G indicates that the well was not filled from total depth to surface, but instead only 88.5 cubic feet of cement were pumped, representing a total height of only 431 to 504 feet based on 6 5/8 inch casing. The plugging record also indicates an obstruction in the well at 290 feet. ExxonMobil should provide an additional record or discussion text, based on the well completion date and drilling practices of that period, documenting that the well was rotary drilled with mud.

   Response: Additional records were researched in reference to AP 231. D-B Associates believes the well to be either a mis-spotted duplicate location for DB-208 or a mis-spotted location for another well. The DB-231 well location is not present on the IHS Energy maps (commercial scout ticket information source), the TGS LogLine maps (commercial well log and scout tick information source), current Tobin oil and gas base maps, current Geomap Company geologic structure maps or historical RRC base maps. In addition, no other records are available for any well at the location. The well location IS present on a current RRC gis map.

8.2.7

Assuming the information provided on the Form W-3 for DB-231 is accurate and that DB-231 is located at the location mapped by the RRC, an evaluation of the status of the well is appropriate. Section 8.3.7 of the Section 8.0 has been revised to include an evaluation of DB-231 and is offered as a replacement for the existing text information. The additional AP 231 records are provided with this response and should be added to the existing records included in Appendix G.

b. Provide additional text early in Section 8.2.3 explicitly clarifying that not all the APs within the path of the composite 10,000 year plume demonstration are located and labeled, by either "DB" or a map ID number, on a single base map such as Plate 8-1 but instead must be determined from a combination of review of Plates 8-1, 8-1A through 8-1D, and 8-2. Clarify also why all DB numbers are not shown on Plate 8-1.

Response: Section 8.2.3 has been edited to clarify that not all the APs within the path of the composite 10,000 year plume demonstration are located and labeled, by either "DB" or a map ID number, on a single base map such as Plate 8-1 but instead must be determined from a combination of review of Plates 8-1, 8-1A through 8-1D, and 8-2. Information has also been added to clarify why all DB- numbers are not shown on Plate 8.1. A revised Section 8.2.3 is provided with this response and is offered as a replacement for the existing text pages.

c. Label all wells tied in on the cross section lines on Plate 8-1 that are identified by "DB" labels on cross section lines on Plates 8-1A through 8-1D and Plate 8-2.

Response: All wells tied in on the cross section lines on Plate 8-1 that are identified by the DB- designation are now labeled on Plates 8-1A through 8-1D and Plate 8-2. Revised Plates 8-1, 8-1A through 8-1D and 8-2 are provided with this response and are offered as replacement for the existing Plates.

d. Appendix H, Volume X contains sensitivity low density plume model cases for Frio E&F and A/B Sands using an average reduced net thickness, based on average net thickness values within the projected plume pathway for injection solely into WDW-397. Plates H-1 and H-2 show the extent of both sensitivity runs as compared to their counterpart runs referenced in Volume I on Plates in Sections 4 and 7. Both sensitivity case boundaries appear to extend slightly outside the limits of the buoyant cases referenced in Section 8.2.3 as being used to show the worst composite plume boundary on Plates 8-1, 8-1A through 8-1D, and Plate 8-2.

ExxonMobil should address the impact of the sensitivity runs on a worst case overall composite boundary in the updip direction towards the Clinton Dome on Section 8 Plates including consideration of sensitivity cases evaluating injection solely into WDW-398 with a reduced net thickness in the Frio A/B and E&F Sands. ExxonMobil may choose to do this by one of the following:

1) Run additional low density plume sensitivity cases for injection solely into WDW-398 in the Frio E&F and A/B Sands. Incorporate the plume boundaries

from the Appendix H sensitivity cases for WDW-397 with the additional cases for WDW-398 into the composite 10,000 year plume boundary on Section 8 Plates. ExxonMobil may elect to show these sensitivity case boundaries on the Section 8 Plates with additional notation as "sensitivity case boundary limits added to the plume composite boundary and supporting discussion in Section 8.

or

2) Assume the sensitivity cases for injection solely into WDW-398 will perform similar to the ones run previously for WDW-397 to determine the margin of the 10,000 year composite plume boundary expansion. Analytically account for the sensitivity cases impacts of injection solely into either WDW-397 or WDW-398 as either a revision of the composite plume boundary or as an additional plume boundary limit with an appropriate label referencing Appendix H sensitivity cases on Section 8 Plates.

Any additional APs not previously reviewed as a result of the sensitivity cases plume boundary should be addressed in Section 8. Appropriate supporting text should be added to Section 8, Appendix H, and elsewhere in the reissuance document as needed to clarify the impact of the sensitivity cases on the composite plume boundary expansion and AP records review.

Response: Additional model runs were prepared which considered future injection into "either" WDW-397 or WDW-398 at an individual maximum injection rate of 1,200 gpm. The majority of these model runs were incorporated into the Section 7.0 text discussion, and the sensitivity cases provided in Appendix H were also revised accordingly. The composite plume boundary now depicted on Plate 8-1 includes the results of the sensitivity case boundary limits. Supporting discussion has been added where appropriate in Section 7.0 and Section 8.0, as well as the associate Section 7.0 and Section 8.0 Plates. Revised Section 7.0 and Section 8.0 text pages and associated Plates are provided with this response and are offered as replacement for the existing text pages.

1. Email dated 2/3/11 - Modeling item 3 concerning map scale issues - I reviewed the draft maps you sent us via overnight mail. Your approach on draft maps with the scale bar revision will satisfy the response to this deficiency. You'll need to submit a complete set of revised scale maps with this approach to fully address the deficiency.

   Response: Revised Section 7.0 Plates (and Section 8.0 Plates) are provided with this response. The subject scale error has been addressed. The revised plates are offered as replacement for the existing plates.

2. Emails dated 2/1 and 2/2/11 - Specific gravity item related to implementation and compliance plan after R6 facility inspection and our phone discussion on 2/1/11 - Your draft revisions submitted by email on 2/2/11 to Section 2, General Administrative Information, and Section 3, Implementation and Compliance, appear to address the hydrometer sample temperature issues, a flexible SG condition range revision at two measurement temperatures instead one and an appropriate correction method for use of a sample temperature other than the one the hydrometer was calibrated for. I reviewed the reissuance document and agree with you that these are likely the only two reissuance sections requiring revision to account for the sample temperature item.

   I had one minor question about the hydrometer correction process for sample temperature. Your draft Section 3 essentially says a 60/60 hydrometer will be used to measure samples at temperatures other than what it is calibrated for, 75 deg F in the correction example, and then correct that reading to a compliance condition temperature, 68 deg F, still different from what the hydrometer is calibrated for.

   In reading through ASTM D 1429-95 Test Method D, hydrometers, Standard Test Methods for Specific Gravity for Water and Brine, it appears that for a 60/60 hydrometer, the correction factor is to add 0.0002 for each sample degree above the hydrometer calibration temperature to correct back to the hydrometer calibration temperature. Using this correction factor, I obtained about the same correction as your draft document showed from going back down from 75 to 68 (a difference of 8 and still higher than the calibration temperature) , 0.00014, yielding a corrected SG of 1.0314 (up from the 1.030 measured at 75) but similar

to the result you showed in the example. Do you have a technical reference for the density ratio method you used instead of the ASTM correction method? Note that the density ratio approach is acceptable for R6 Land Ban to use in the reissuance but for my own clarification I'm asking a technical reference for the density ratio.

Response: Section 2.0 and Section 3.0 text have been revised to address the hydrometer sample temperature issues, and a flexible SG condition range revision at two measurement temperatures instead one has been added and an appropriate correction method for use of a sample temperature other than the one the hydrometer was calibrated for has been added. In addition, a reference to the ASTM 1429-95 Test Method D has been added to the Section 3.0 text to suggest that the correction method to be employed by ExMob provides a similar correction factor. Revised Section 2.0 and Section 3.0 text pages are provided with this response and are offered as replacement for the existing text pages.

3. Area of Review deficiency 1.d. - This one is an issue for further phone discussion after I did additional "big picture" reissuance review and thoughts about the low density plume models along with what condition is actually requested. The injection volume condition being requested basically asks for cumulative injection volume in Frio D of 360 gpm into WDW-397 only as ExxonMobil explicitly states it will complete WDW-398 in the Frio D, despite a pressure buildup demonstration for D injection into WDW-398. As far as the Frio A/B and E&F sands, the injection volume limit requested is based on a maximum rate of 1200 gpm into **either** sand, **but** also a maximum rate in **either** WDW-397 **or** WDW-398 of **1200 gpm** for **either** Frio sand. The requested condition is detailed on Page 2-8 in Section 2 of Volume 1.

   As it stands right now, the pressure buildup models effectively bound the range of worst injection pressure increases by modeling scenarios for injection only in WDW-397, then only in WDW-398, and finally a split future injection case equally into WDW-397 and WDW-398 for each of the Frio D (360 gpm) despite WDW-398 not be allowed to inject into the Frio D), Frio E&F (1200 gpm total), and Frio A/B (1200 gpm total). The pressure buildup models appropriate address the condition requested.

   The plume cases are another matter. As discussed in Sections 7.5.1, 7.5.2, 7.5.3, future total injection is split equally into WDW-397 and WDW-398 as 180 gpm each for a total of 360 gpm in the Frio D, 600 gpm each for a total of 1200 gpm in either the Frio E&F and A/B Sands, but the requested condition asks for 360 gpm in the D into WDW-397, and 1200 gpm for either the E&F and A/B Sands into either WDW-397 or WDW-398. As it stands the 10,000 year plume models do not match up with the requested condition in Section 2. Similarly, in this reissuance, Appendix H also included sensitivity model runs except that future total injection increased to 1200 gpm and flow, instead of being only in WDW-397 as

in the original petition, is split equally between WDW-397 and WDW-398 after allowing for the historical injection into WDW-397 only, again to address thinning sands as the plume drifts towards the Clinton Dome. So both the demonstration and sensitivity plume model runs conflict with the requested condition. Also the AOR map, Plate 8-1 (and supporting AOR) have a composite worst case plume boundary based on these existing plume runs, so the requested injection volume condition is not fully supported by them either.

Options to address this would include:

1) Revise the requested condition to allow 1200 gpm total into either Frio A/B or Frio E&F, but limit the rate into either sand to each well to 600 gpm. This would match up with what is currently plume modeled for the E&F and A/B, but would limit sand injection volumes should a well be down. The Frio D plume model needs to be rerun at 360 gpm into only WDW-397 to allow for 360 gpm into it, since it is the only well allowed to be completed into Frio D.

2) Revise the plume models and corresponding plume boundaries on the AOR maps to match with the requested injection condition in Section 2.

Response: Additional model runs were prepared which considered future injection into "either" WDW-397 or WDW-398 at an individual maximum injection rate of 1,200 gpm. The majority of these model runs were incorporated into the Section 7.0 text discussion, and the sensitivity cases provided in Appendix H were also revised accordingly. The composite plume boundary now depicted on Plate 8-1 includes the results of the sensitivity case boundary limits. Supporting discussion has been added where appropriate in Section 7.0 and Section 8.0, as well as the associated Section 7.0 and Section 8.0 Plates. Revised Section 7.0 and Section 8.0 text pages and associated Plates are provided with this response and are offered as replacement for the existing text pages.

TERRA
DYNAMICS INC
INJECTION WELL SERVICES - OIL & GAS CONSULTING

June 9, 2009

09-104

Mr. Brian Graves
U.S. Environmental Protection Agency
Allied Bank Tower at Fountain Place
1445 Ross Avenue
6WQ-SG
Dallas, Texas 75202-2733

6WQ-SG
JUN 12 2009

Re: ExxonMobil Petition Reissuance Request

Dear Brian:

Enclosed, please find a no-migration reissuance request for the ExxonMobil WDW-397 and WDW-398 injection wells. As you are aware, ExxonMobil is currently constructing a second injection well (WDW-398) at the Agrifos Fertilizer Plant located in Pasadena, Texas. This document is being submitted to add the operation of WDW-398 into the existing No-Migration Petition authorization which covers the operation of WDW-397. This reissuance request also modifies the injection rates previously authorized in the approved No-Migration Petition.

Should you have any questions or comments, or require additional information concerning the enclosed documents, please do not hesitate to call me at (512) 795-8183. We will address any questions or comments you may have at that time.

Sincerely,

Terry D. Moody

Terry D. Moody, PG
Project Manager/Senior Geologist

TDM/tdm
Attachment

cc: Buddy Hand - ExxonMobil

1616 WEST HOWARD LANE STE. 9-980 AUSTIN, TEXAS 78728 512-795-8183

Response to July 21, 2010 Notice of Deficiency

ExxonMobil
Agrifos Facility - Pasadena, Texas
WDW-397 and WDW-398 - 2009 Petition Reissuance
July 21, 2010 Notice of Deficiency

Section 1 – Executive Summary

1. In Section 1, Page 1-8, Volume I, ExxonMobil provides and references a property ownership map as an unlabeled figure showing the two ExxonMobil well easements surrounded by Agrifos property. ExxonMobil identifies Agrifos as the only adjacent property owner; however, the ownership of the land immediately adjacent to the south of the WDW-398 easement is unclear. ExxonMobil should clarify the property ownership immediately south of the WDW-398 easement.

Response: The property on which the WDW-398 injection well is located is surrounded by Agrifos Fertilizers LLC property. To the south of the Exxon Mobil property location, ExxonMobil has a limited easement to access the site location. The location map depicted on the property figure provided on Page 1-8 has an older and incorrect version of the property orientation for the WDW-398 injection well location. A revised Page 1-8 is provided with this response and shows the current orientation of the WDW-398 well location property.

Section 2 – General Administrative Information

1. In Section 2.6, Pages 2-6 and 2-7, Volume I, ExxonMobil lists proposed petition approval conditions. ExxonMobil should also include a brief narrative in this section clarifying that this is a reissuance as opposed to an initial petition and noting the proposed changes from the original petition (e.g., addition of a second well, increased injection volumes, etc.) prior to listing the proposed approval conditions.

Response: Section 2.6 has been revised and includes both the currently authorized petition conditions and the proposed petition approval conditions. The narrative included at the beginning of Section 2.6 has been expanded to clarify that the subject document is a reissuance request, rather than an initial petition request and also notes the proposed changes from the original petition. Revised text pages 2-6 to 2-11 (revision date: August 27, 2010) are included with this response and are offered as replacement text pages for the existing document text pages.

Section 4 – Geology and Hydrogeology

1. ExxonMobil should include a composite annotated log of well WDW-398 in the petition.

Response: Two copies of a composite annotated log of WDW-398 are included with this response. One copy of the log should be placed in Appendix B and the second copy should be placed in Appendix C-9.

2. ExxonMobil has included drilling and completion reports for WDW-398 in Appendices J1-J3, Volumes XI-XIII and requested addition of the well as part of this reissuance, but has not revised the site geologic maps in Volume I to incorporate geologic information obtained

from logging WDW-398. EPA notes that some geologic information is included in Appendices J1-J3, but not discussed in Volume I. ExxonMobil should address the following items concerning site geology in Volume I:

a. Incorporate WDW-398's logging results into the structure and isopach maps for the Frio D, E&F, and A/B sands included as Plates and Figures in Section 4 and in the primary geologic discussion as appropriate.

   Response: Figure 4-13 and Plates 4-4, 4-5, 4-6 ("proposed" removed from WDW-398 well location), 4-7 ("proposed" removed from WDW-398 well location), 4-8, 4-9, 4-10, 4-11 and 4-12 have been revised to incorporate the logging results from WDW-398. In addition, text revisions (minor) were made to the geology discussion (Section 4.0) to incorporate information associated with the logging results from WDW-398. Revised figures and plates, and a revised Section 4.0 (page 4-7, pages 4-12 through 4-47) are provided with this response and are offered as replacement materials for the existing document pages, figures and plates.

b. Include WDW-398's information in Table 4-1.

   Response: A revised Table 4-1 is included with this response and includes the information for WDW-398. Note that the location information for WDW-397 was also revised.

c. Include WDW-398's electrical log as part of Plate 4-2, Strike-Oriented Structural Cross Section B-B' adjacent to WDW-397's electrical log or on one of the other cross sections or directly reference pertinent cross sections in Appendices J1-J3 which show WDW-398's electrical log correlated to other area logs including WDW-397.

   Response: Plate 4-2 has been revised and includes WDW-398's electrical log adjacent to WDW-397's electrical log. Plate 4-2 and Plate 10-1 (included in Appendix J1) are nearly identical (minor differences in the location map included at the bottom of each plate). The revised Plate 4-2 is included with this response and is offered as a replacement document for the existing Plate 4-2.

d. Revise the discussion for WDW-397's logging results on Pages 4-37 through 4-39 to also include logging results from WDW-398.

   Response: Page 4-39 and 4-40 of the enclosed and revised Section 4.0 includes discussion for the logging results from WDW-398. The revised text pages are offered as replacement pages for the existing document pages.

e. Include all core data for WDW-398 in the Volume I core data discussions.

   Response: Core data discussion for WDW-398 has been added to the geology discussion (where appropriate). Although core data for WDW-398 is included in Appendix J-3, a copy of the WDW-398 core data is included with this response and should be inserted in Appendix C-8. A revised Appendix C Table of Contents is also provided. The revised text pages are offered as additional material or as replacement text pages for the existing document pages.

3. Plate 4-1, Map Showing Local Study Area, ExxonMobil should update this map. It is confusing and the legend is incomplete as to the different symbols and colors used for the high density and low density plumes and the Frio D, A/B, and E&F sands.

   Response: In order to simplify the information presented on Plate 4-1, three separate Plates were prepared and the data presented on Plate 4-1 was distributed across the three new plates. Plate 4-1A, Plate 4-1B and Plate 4-1C are each Maps Showing the Local Study Area. Plate 4-1A also depicts the location of the Frio D Sand 10,000-year waste plumes, while Plate 4-1B depicts the location of the Frio E&F Sand 10,000-year waste plumes, and Plate 4-1C depicts the location of the Frio A/B Sand 10,000-year waste plumes. The legend has been corrected for each plate and is much simpler given that the amount of data displayed has been reduced. The new plates 4-1A, Plate 4-1B and Plate 4-1C are provided with this response and are offered as replacement for the existing Plate 4-1.

4. The following comments relate to Plate 4-2 and Plate 10-2, Structural Cross Section B-B' and Plate 4-3 and Plate 10-1 Structural Cross Section A-A'.
   a. ExxonMobil included WDW-398 in Plate 10-2 (which is an updated Plate 4-2) but the top of the Anahuac is shown at a different depth between Plate 10-2, and 10-1. ExxonMobil should address this.

      Response: The top of the Anahuac depicted on Plates 4-2, 4-3, 10-1 and 10-2 has been revised (where appropriate) and is now consistent on each plate.

   b. The "remarks" shown below WDW-397, should be re-written to show the depth "6572" first and then "6634".

      Response: The "remarks" shown below WDW-397 have been re-written on the subject plates to read 6,572' to 6,634'.

   c. The "remarks interval" (6572 to 6634) should be highlighted on the WDW-397 log for all places in the petition where the remarks are shown on the log.

      Response: The "remarks interval" (6572 to 6634) has been highlighted on the WDW-397 log for all places in the petition where the remarks are shown on the log.

   d. On cross sections, if a formation top is a mapped horizon, add the Plate number for the structure map to the label.

      Response: The Plate Number corresponding to an appropriate structure map has been added to Plates 4-2, 4-3, 10-1 and 10-2.

      Revised Plates 4-2, 4-3, 10-1 and 10-2 are included with this response and are offered as replacement plates for the existing plates.

5. On Plate 4-8, Frio D Sand Structure and Plate 4-10, Frio E&F Sand Structure, ExxonMobil shows artificial penetration (AP) 15 on the south side of the B' fault. If the fault in AP 15 is

at -4757 feet as shown, then AP 15 is shown on the incorrect side of the fault in these Plates. ExxonMobil will need to address this.

Response: The B' identifier is associated with the end point for the B – B' cross-section. It is assumed that EPA is referring to Fault A. Regardless, the fault information for AP 15 present on Plate 4-8 and 4-10 is an apparent artifact from previous "drafts" of the plates and is not accurate. Note that the subject fault information is absent from the Plate 4-4 structure map. The fault notation has been removed and corrected Plates 4-8 and 4-10 are included with this response and are offered as replacement plates for the existing plates.

6. In Section 4.2.2, Page 4-19, Volume I, ExxonMobil references the High Definition Induction Log from Merisol's WDW-319 in a discussion about the shale interval between the Frio E&F and A/B sands and states that it is in Appendix B. The log could not be found in Appendix B. ExxonMobil should provide the log or clarify where it is located in the reissuance document.

   Response: Two copies of the Marisol WDW-319 log are included with this response. One copy of the log should be placed in Appendix B and the second copy should be placed in Appendix C-9.

7. In Section 4.3, Pages 4-38 and 4-39, Volume I, ExxonMobil discusses the Mud logging Company USA mud log for WDW-397 to establish the top of the Frio D sand and states that it is in Appendix B. The log could not be found in Appendix B. ExxonMobil should provide the log or clarify where it is located in the reissuance document.

   Response: Copies of that portion of the mud log for WDW-397 that are appropriate to the discussion in Section 4.3 are provided with this response. The subject information should be added to Appendix B as appropriate.

Section 5 – Injection Well Construction

1. In Section 5.3, Pages 5-5 through 5-8, Volume I, ExxonMobil discusses the 2008 mechanical integrity testing for WDW-397. ExxonMobil should update the mechanical integrity discussion and appendices to include the most recent testing for WDW-397. ? 2010 for 398 & 397

   Response: Section 5.3 has been amended to summarize the 2009 mechanical integrity testing of WDW-397. Revised Section 5 text pages (5-6 through 5-12) are provided with this response and are offered as a replacement for the existing Section 5 material. Updated Figures 5-1 and 5-2 are also included with this response and are offered as replacement pages for the existing Figures 5-1 and 5-2.

2. In Section 5.3.1, Pages 5-5 and 5-6, Volume I, ExxonMobil discusses the 2006 baseline differential temperature survey for WDW-397 and states that it is in Appendix F. The log could not be found in Appendix F. ExxonMobil should provide the log or clarify where it is located in the reissuance document.

Response: A copy of the 2006 baseline differential temperature survey for WDW-397 is provided with this response and should be placed in Appendix F of the existing petition document.

3. In Section 5.5, Page 5-8, Volume I, ExxonMobil discusses that mechanical integrity testing (MIT) for WDW-398 is Appendices J1-J3. ExxonMobil should expand this discussion to reference MIT-related sections and appendices in Appendices J1-J3 where individual components of the WDW-398 MIT can be found and summarize what the results were.

   Response: Section 5.5 has been amended to summarize the 2009 mechanical integrity testing of WDW-398. References to Appendices J1-J3 have been revised accordingly. Revised Section 5 text pages are provided with this response and are offered as a replacement for the existing Section 5 material.

<u>Appendices J1-J3 – Construction Summary for WDW-398</u>

1. In the Appendix J1 Table of Contents, a listing of lists shows that a List of Tables is on Page iii; a List of Figures, a List of Plates, and a List of Appendices are on Page iv; a List of Attachments is on Page vi; and the Certification is Page vii. The page numbering in the Table of Contents is different from that shown for the actual locations of the list summaries as no Pages iii, iv, v or vi were found. Additionally, no list of attachments was found in the document. ExxonMobil should review the Table of Contents layout for correctness.

   Response: The Appendix J1, J2 and J3 Table of Contents have been revised to better identify the contents of each of the Appendices (and "sub" Appendices). The page numbering has been corrected and the list of attachments "listing" has been removed. In addition the Appendix J4 and J5 Table of Contents were edited as appropriate. Revised Appendix J1, J2, J3, J4 and J4 Tables of Contents pages are provided with this response and should be utilized as replacement pages for the petition document.

2. In Section 1, Page 1-1, Appendix J-1, Volume XI, ExxonMobil discusses the plugging of the initial WDW-398 borehole, WDW-398A, and references the drilling and plugging report for that borehole as being in Attachment A. Attachment A was not found. ExxonMobil should identify where in Appendices J1-J3 Attachment A can be found or provide a copy of it.

   Response: Page 1-1 of Appendix J-1 has been edited to indicate that the drilling and plugging report of the initial WDW-398 borehole, WDW-398A, is included in Appendices J-4 and J-5. A revised text page (Page 1-1 of Appendix J-1) is provided with this response and is offered as a replacement page for the existing Page 1-1 in Appendix J-1.

3. In Section 1, Pages 1-3 and 1-4, Appendix J-1, Volume XI, ExxonMobil discusses the actual injection zone, injection interval, and confining zone depths for WDW-398 based on logging results. In Section 2.6, Volume I, ExxonMobil lists the requested reissuance conditions for both WDW-397 and WDW-398. ExxonMobil should reconcile the requested injection zone and injection interval depths with the actual results obtained from logging WDW-398. ExxonMobil should also reconcile any approximate depths discussed for WDW-398 in Volume I (e.g., injection zone, injection interval, confining zone, and lowermost source of

underground drinking water (USDW)) with the actual depths determined as reported in Volumes XI-XIII.

Response: The information provided on Pages 1-3 and 1-4 of Appendix J-1 which discusses the actual injection zone, injection interval, and confining zone depths for WDW-398 based on logging results has been revised. The information included in Section 2.6 has also been revised to be consistent with the information discussed on the subject pages. Revised Appendix J-1 (Pages 1-3 and 1-4) are offered as replacement text pages for insertion into the petition reissuance document.

4. In Appendix J-1, Section 5, Page 5-3, Volume XI, ExxonMobil discusses a baseline temperature log being run in WDW-398. ExxonMobil should reference the appendix where the temperature log is located.

   Response: The temperature log discussed on Page 5-3 of Appendix J-1 is not the "official" baseline temperature log and was run for well construction purposes rather than as a demonstration of mechanical integrity and is not provided as a critical component of the construction demonstration. The text discussed on Page 5-3 has been revised to indicate that the subject temperature log was run as a "preliminary" temperature log. The official differential temperature survey discussed on page 8-1 of Appendix J-1 was run after the well was completed and covers the interval from surface to total depth. This temperature log is provided in Appendix X of Appendix J-3 (Volume XIII).

   needs add'l text ?

5. In Appendix J-1, Section 7, Page 7-1, Volume XI, ExxonMobil references two WDW-398 sidewall correlation logs in Appendix V of Appendix J3, Volume XIII. The July 18, 2009, log includes a depth indicator for its SP and tension tracks, while the July 1, 2009, log shows an SP track without a depth indicator or tension track. Sidewall cores were collected on both dates and log headers show that significant footage was logged on both logs. ExxonMobil should clarify why the tracks are different between the two logs and no depth indicator is shown on the initial July 1 log.

   Response: The July 1, 2009 Halliburton Sidewall Core Report log was edited to add footage as logged. Note that both the log header and the log run footer and header include the depth logged. Tension was simply not run as part of the July 1, 2009 log, hence the difference between the logs with respect to this track. A revised copy of the July 1, 2009 Halliburton Sidewall Core Report log is provided with this response and is offered as a replacement for the log present in Appendix V of Appendix J-3 (Volume XIII).

6. In Appendix J1, Section 8.3, Pages 8-2 through 8-5, Volume XI, ExxonMobil discusses the results of radioactive tracer survey (RAT) for WDW-398 run as part of the MIT and references the September 30 2009, RAT log provided in Appendix Z. A review of the log shows a large anomaly on the pre-tracer gamma ray (GR) survey. The anomaly is present both immediately above the packer and just below it inclusive of the screen tell tale area. No explanation was included on either the log or in Section 8.3 for the anomaly. ExxonMobil should expand the discussion text in Section 8.3 to address the anomaly.

   Response: The anomaly observed on the September 30 2009 RAT log is believed to be associated with a small amount of RA material being inadvertently released while logging up in the well. The discussion text in Section 8.3 has been expanded to address the anomaly. Revised Section 8.0 text pages are provided with this response and are offered as replacement text pages for the existing Section 8.0 text pages.

7. In Appendix J1, Section 9.1, Pages 9-1 and 9-2, Volume XI, ExxonMobil discusses the initial falloff test for WDW-398 and references the test analysis in Appendix DD, Volume XIII, and in Figures 9-2 through 9-5. The falloff test discussion indicates that significant rate variations occurred before the well was shut in; however, the falloff test analysis in Appendix DD does not appear to show that superposition was used to account for rate variation prior to shut in. Additionally, the analysis plots show anomalous pressure behavior in the form of pressure fluctuations up and down during the falloff which made the test analysis questionable. ExxonMobil should address the following items concerning the falloff:

   a. Provide an electronic copy of the falloff test data for EPA review.

      Response: An electronic copy of the fall-off test data is provided with this response and should be added to Appendix DD of Volume XIII.

   b. Explain the anomalous pressure behavior on the falloff analysis plots.

      Response: As EPA has correctly pointed out, the fall-off test analyses plots show anomalous pressure behavior in the form of pressure fluctuations both up and down during the fall-off test. In an attempt to explain the unusual fluctuations, field notes and other data recorded during the September 2009 reservoir test were revisited. TDI staff confirmed that the flow valves were properly functioning and were tightly closed during the fall-off test, thus eliminating surface valve leakage as a source of the anomalous data. As a means of validating the gauge response, TDI staff next plotted the BHP data recorded with the Panex surface readout (SRO) pressure gauge against the BHP data recorded with the AKS Technologies memory readout (MRO) pressure gauge. After correcting the data for psia versus psig, the pre-injection BHP and late-time BHP data show close agreement. In addition, the MRO data appears more normal (or closer to what one would expect). The large anomalous pressure "spikes" occur when injection is introduced into the well and when flow rate is changed and/or stopped. Consequently, these periods (initiation of injection and cessation of injection) are periods of large and relatively fast changes in bottom-hole temperature and pressure. Given these observations, TDI staff suspect that the sensor coefficients may have been entered incorrectly for the Panex SRO, thus creating erroneous pressure compensation during the periods of large temperature and pressure change. The WDW-398 September 2009 fall-off test was reanalyzed using the BHP data recorded by the MRO. The revised reservoir test analyses also employed a reservoir thickness of 184 feet based on the spinner survey results (both the spinner survey and the injection test were performed at 210 gpm). Revised Appendix DD data is included with this response and is offered as a replacement for the existing Appendix DD data found in Appendix J-3 (Volume XIII).

      It is important to note that the injection/fall-off test performed on WDW-398 was not performed under optimum conditions. Due to test fluid volume limitations, the injection test lasted less than 5 hours and was performed at a fairly low injection rate.

The pressure wave induced in the reservoir had a very small amplitude (pressure difference in the wellbore between the flowing BHP and the static BHP was only 21 psi). Given the short injection test, small amplitude pressure wave, total potential receiving interval thickness of more than 300 feet, and a very permeable reservoir, quantitative analyses of the data may yield results which are not truly representative of Frio E&F Sand and Frio A/B Sand reservoir parameters. The reservoir test results do provide a reasonable qualitative assessment of the Frio Sands in WDW-398. The reservoir test analyses provided with this response focuses on the late time data of the fall-off test. The fall-off test data and injection test data were both analyzed and simulated with a close match of the late time data. In addition, the fall-off test data was also analyzed by incorporating a variable rate analysis into the fall-off test analysis. The derived permeability and skin factor values employed in the simulations provide a good match for the late-time data for each scenario (note that the log-log simulation plots show a better match of the late time data than the semi log simulation plots). Although the reservoir test was performed at less than optimal conditions, analyses of the reservoir test data provided permeability and transmissibility values which are within the range of values derived from the reservoir testing WDW-397.

c. Incorporate variable rate analysis into the falloff analysis and determine how the results are impacted.

Response: A variable rate analysis was performed on the WDW-398 fall-off test data as an additional means of analyzing the test data. Section 9.3 of Appendix J-1 (Volume XI) has been edited to incorporate the additional analyses. Revised Appendix DD data of Appendix J-3 (Volume XIII) is provided with this response and is offered as replacement for the existing Appendix DD data set.

d. Incorporate WDW-398's falloff test results into the model parameter discussions in Section 7, Volume I, addressing items such as static pressure, transmissibility, and permeability.

Response: The WDW-398 fall-off test results have been added to the model parameter discussions in Sections 7.3.2 and 7.3.3. Revised Sections 7.3.2 and 7.3.3 are provided with this response and are offered as replacement pages for the existing text pages.

8. In Appendix J1, Section 9.2, Page 9-3, Volume XI, ExxonMobil discusses the initial spinner survey for WDW-398 and references the spinner survey in Appendix CC, Volume XIII. ExxonMobil discusses that the spinner survey was run with a single while injecting up pass with multiple stationary stops from 7090' KB to 6500' KB with Frio A/B Sand present from 6993' KB to 7110' KB and the Frio E&F Sand is present from 6755' KB to 6936' KB. The log spinner results table, which appears to be based on the continuous spinner up run interpreted in 10 foot increments from 6900' to 6650' KB, shows no injectate flow below 6890' KB. Spinner stationary stops 1-3 corresponding to depths of 7050', 7000', and 6950' KB also show no flow with stop 3 listed on the log as representing the interval from 6890' to 6950' KB. Stationary stop 4 at 6850' KB shows 25% flow but was listed on the log as representing the interval from 6830' to 6890' KB, well above the A/B Sand top. The

discussion table on Page 9-3 states that 25% of the flow is entering the A/B Sand; however, the stationary stops and continuous up pass interpretation appear to show no flow going into the A/B Sand. ExxonMobil should provide clarification concerning the spinner survey results showing no injectate entering the A/B sand. EPA notes that future spinner surveys should include a second up pass run and a repeat set of stationary stops to confirm the log responses and interpretation. ExxonMobil should also incorporate the results of the WDW-398 spinner survey into the modeling discussion in Section 7, Volume I.

Response: The discussion concerning the spinner survey results provided of Page 9-3 of Section 9.2 of Appendix J-1 has been edited. EPA correctly notes that at the test injection rate (210 gpm); the Frio A&B Sand does not receive injected fluid. The discussion text has been appropriately edited to reflect these test results. Additional text was also added to suggest that future spinner survey profiles will be performed at much higher injection rates and that repeat passes and stationary stops will be performed as a matter of redundancy. The discussion text in Section 8.3 has been expanded to address the anomaly. Revised Section 9.2 text pages are provided with this response and are offered as replacement text pages for the existing Section 9.0 text pages. In addition, Section 7.3.2 of the Modeling Section (Section 7.0) of Volume I has been edited to incorporate information for the WDW-398 spinner survey. Revised Section 7.3.2 text pages are provided with this response and are offered as replacement text pages for the existing Section 7.3.2 text pages.

9. ExxonMobil should incorporate or reference the details of the injection and confining zones characteristics discussion in Section 10, Pages 10-1 through 10-4, Appendix J1, Volume XI for WDW-398 into the overall discussions concerning site geology and modeling parameters in Sections 4 and 7 in Volume I.

Response: The details of the injection and confining zone characteristics discussion in Section 10, Pages 10-1 through 10-4, Appendix J1, Volume XI for WDW-398 have been integrated into the overall discussions concerning site geology and modeling parameters in Sections 4 and 7 in Volume I. Revised Section 4 and Section 7 text pages are provided with this response which appropriately integrates this information.

Section 6 – Injection Fluids

1. In Section 6.1, Pages 6-5 and 6-6, Volume I, ExxonMobil discusses waste sample results and references Table 6-1 which contains historical sample information for pond water, gyp stack water, and injectate with the actual analyses provided in Appendix C. The last fluid sample listed in the table was injection fluid taken in January 2009. ExxonMobil should update the table to include the results from the most recent samples of injectate available.

Response: A revised Table 6-1 is included with this response and includes the most recent sample results (December 14, 2009). In addition, analytical results are provided for the sample collected on December 14, 2009 and should be added to the Appendix C data.

Section 7 – Modeling

1. In Section 7.2, Pages 7-3 and 7-4, Volume I, ExxonMobil discusses the depths of Frio sands D, E&F, and A/B in WDW-397 and how these depths were implemented in the demonstration modeling for each sand. Appendices J1 through J3, Volumes XI-XIII contain some similar items for WDW-398. ExxonMobil should address the following items for

WDW-398 concerning the modeling depths for the various Frio sands in the modeling text in Volume I:

a. Provide additional discussion text delineating the equivalent depths of the corresponding Frio sands in WDW-398.

   Response: Additional discussion text has been added to Section 7.2 which delineates the Injection Zone, Injection Interval and Frio D, Frio E&F and Frio A/B Sands in WDW-398. Revised Section 7.2 text pages are provided with this response and serve as replacement text pages for the existing text pages.

b. Provide and reference a figure for WDW-398 analogous to Figure 7-1A.

   Response: Figure 7-1B has been created and is analogous to Figure 7-1A. Text revisions have been integrated into Section 7.2 which references the new figure. Revised Section 7.2 text pages are provided with this response and serve as replacement text pages for the existing text pages. The newly created Figure 7-1B is included with this response and should be inserted with the Section 7 figures of the existing petition document.

c. Expand Figure 7-1 to include the electrical log for WDW-398 or reference the equivalent figure, if available, in Appendices J1-J3.

   Response: Figure 7-1 has been edited and now includes the WDW-398 electrical log as part of the demonstration. Text revisions have been integrated into Section 7.2 which references the revised figure. Revised Section 7.2 text pages are provided with this response and serve as replacement text pages for the existing text pages. The revised Figure 7-1 is included with this response and serves as replacement figure for the existing Figure 7-1.

2. In Section 7.3.1, Pages 7-7 through 7-10, Volume I, ExxonMobil discusses net thickness values used in the pressure buildup and low density plume demonstration models for Frio D, E&F, and A/B sand. ExxonMobil should address the following items concerning the demonstration model net thicknesses:

   a. Include text discussing the net thickness for the three injection intervals at WDW-398.

      Response: Section 7.3.1 has been edited to include net thickness for the Frio D Sand, Frio E&F Sand and Frio A/B Sand observed in WDW-398. A revised Section 7.3.1 is included with this response and is offered as a replacement for the existing text pages.

   b. The thickness justification discussion uses the same text and thickness values from the initial petition based on average net thickness values within the paths of the original WDW-397 operational and 10,000 year low density plumes. The plume sizes for both the operational and 10,000 year timeframes expanded in this petition reissuance with the increased rate requested. ExxonMobil should verify that the average values cited for each sand are still valid and justify the net thickness in the models for the expanded plumes.

Response: The thickness justification discussion provided in Section 7.3.1 was reviewed to ensure that average reservoir thickness values were appropriate for the expanded operational and 10,000-year timeframes in the petition reissuance demonstration.

Frio D Sand – the Frio D Sand is thinner than anticipated at the WDW-398 location. The text has been revised to incorporate the net sand thickness for the WDW-398 location. The Frio D Sand net thickness within the expanded operational area was recalculated both due the revised net sand thickness around the WDW-398 well location and due to the expanded operational plume size. The Frio D Sand has a net thickness of about 29 feet at the WDW-397 injection well location, about 18 feet at the WDW-398 injection well location, and has an average net thickness value of 30 feet within the end-of-operations waste plume, and has an average net thickness of 36 feet within the projected path of the 10,000-year buoyant plume. To account for the absence of the Frio D Sand, the grid cells within the approximate 10-foot thick contour interval line were made inactive via use of the R1-26 Card (FPV=0). A net sand thickness of **25 feet** was selected as a representative thickness of the Frio D Sand interval within the remainder of the modeled area. Therefore, the reservoir thickness value employed for the Frio D Sand remains valid.

Frio E&F Sand – the Frio E&F sand thickness in the WDW-398 injection well is very close to the thickness in WDW-397. The Frio E&F Sand net thickness within the expanded operational area was recalculated due to the expanded operational plume size. The Frio E&F Sand has a net thickness of about 188 feet at the WDW-397 injection well location, about 184 feet at the WDW-398 injection well location, and has an average net thickness value of 189 feet within the end-of-operations waste plume, and has an average net thickness of 133 feet within the projected path of the 10,000-year buoyant plume. The average net thickness over the project path is equivalent for this petition reissuance. In general, reservoir thickness within the expanded plume area across the Clinton Dome is slightly less, but the expanded plume size in the southeast portion of the waste plume extends into slightly thicker net sand areas. When averaged across the plume area, the net sand for the petition reissuance demonstration is essentially the same (1 foot thicker) as the original petition demonstration. For this demonstration, both the base case 10,000-year plume model (150-foot reservoir thickness), and the sensitivity analyses 10,000-year plume model (132-foot reservoir thickness) are appropriate.

Frio A/B Sand – the Frio A/B sand thickness in the WDW-398 injection well is very close to the thickness in WDW-397. The Frio A/B Sand net thickness within the expanded operational area was recalculated due to the expanded operational plume size. The Frio A/B Sand has a net thickness of about 152 feet at the WDW-397 injection well location, about 147 feet at the WDW-398 injection well location, and has an average net thickness value of about 143 feet within the end-of-operations waste plume, and has an average net thickness of about 91 feet within the projected path of the 10,000-year buoyant plume. Similar to the Frio E&F Sand, in general, reservoir thickness within the expanded plume area across the Clinton Dome is approximately equal (or slightly less), but the expanded plume size in the southeast portion of the waste plume extends into thicker net sand areas. When averaged across the plume area, the net sand for the petition reissuance demonstration remains at 91 feet. For this demonstration, both the base case 10,000-year plume model (125-foot reservoir thickness), and the sensitivity analyses 10,000-year plume model (91-foot reservoir thickness) are appropriate.

A revised Section 7.3.1 is included with this response and is offered as a replacement for the existing text pages. The revised text incorporates the information provided in response to the specific deficiency.

c. A single flowmeter survey run in 2006 was referenced and provided in Appendix C as part of the net thickness discussion. The discussion should also reference and include the results of all past flow survey(s) run in WDW-397 and WDW-398, inclusive of the most recent surveys, as part of the net thickness justifications for each interval.

   Response: Flow meter profile discussion in Section 7.3.1 and Section 7.3.2. Flow meter profile discussion included in these sections have been edited and/or revised to reference the 2006, 2008 and 2009 flow meter profile surveys ran in WDW-397 and the 2009 flow meter profile survey ran in WDW-398. In addition, flow meter profile logs and text excerpts from annual reservoir test reports are provided for inclusion in Appendix C-9. Revised Section 7.3.1 and Section 7.3.2 text pages are provided with this response and serve as replacement text pages for the existing text pages.

3. In Section 7.3.3, Page 7-20, Volume I, ExxonMobil lists historical static pressures obtained from WDW-147, an offset injector, completed in the Frio E&F Sand. The table was included in the original ExxonMobil petition. The table from the reissuance document differed from the table in original petition with the 2007 static pressure data missing and several data points differing from the original table for the same dates. ExxonMobil should review the original petition table in conjunction with the corresponding reissuance table and reconcile the differences.

   Response: The subject table which lists the historical static pressures obtained from WDW-147 provided in the most recent reissuance document was copied over from an earlier version of the petition document and is incorrect. Revised Section 7.3.3 text is provided with this response which corrects this error. The data provided in the original ExxonMobil petition is properly included on the revised text pages.

   still has errors

4. In Section 7.3.3, Page 7-21, Volume I, ExxonMobil lists a table showing historical static pressures obtained from WDW-319, an offset injector, completed in the Frio A/B Sand. The table was included in the original ExxonMobil petition. The table from the reissuance document differed from the table in original petition ExxonMobil should review the reissuance table for WDW-319 data in conjunction with the corresponding original petition table and reconcile the differences.

   still has errors

   Response: The subject table which lists the historical static pressures obtained from WDW-319 provided in the most recent reissuance document was also copied over from an earlier version (see response to Modeling NOD No. 5) of the petition document and is incorrect. Revised Section 7.3.3 text is provided with this response which corrects this error. The data provided in the original ExxonMobil petition is properly included on the revised text pages.

5. In Section 7.3.3, Page 7-21, Volume I, ExxonMobil references Appendix C, Volume III as containing current bottom hole pressure data for WDW-397. Appendix C included 2006 and 2008 falloff tests. ExxonMobil should add the 2009 falloff test for WDW-397 to Appendix C and reference any falloff test data for WDW-398 as well.

   Response: Information concerning the 2009 fall-off test for WDW-397 is provided with this response and should be added to Appendix C-5. Section 7.3.3 text has been edited to indicate the location of the WDW-398 reservoir test data as being included in Appendices J-1 and J-3. Revised Section 7.3.3 text is provided with this response and is offered as replacement text for existing petition document text pages.

6. In Section 7.3.4, Pages 7-22 through 7-24, Volume I, ExxonMobil discusses formation temperature in WDW-397 and offset injection wells. ExxonMobil should include additional discussion about the bottom hole temperature data obtained in WDW-398.

   Response: Section 7.3.4 has been edited and incorporates bottom-hole temperature data collected in WDW-398. Revised Section 7.3.4 text is provided with this response and is offered as replacement text for existing petition document text pages.

7. In Section 7.3.5, Pages 7-24 and 7-25, Volume I, ExxonMobil discusses core porosity data from WDW-397 and offset injectors to justify porosity values used in the demonstration models. ExxonMobil should include additional discussion about porosity data obtained from WDW-398 and reference the data.

   Response: Section 7.3.5 has been edited and incorporates core porosity data collected in WDW-398. Revised Section 7.3.5 text is provided with this response and is offered as replacement text for existing petition document text pages.

8. In Section 7.3.7, Page 7-27, Volume I, ExxonMobil references Figure C-1 in Appendix C, Volume III as showing the average dip angle used in the high density plume demonstration models. ExxonMobil should correct the figure reference to Figure C-9.

   Response: Section 7.3.7 has been edited to reference the correct figure (Figure C-9). Revised Section 7.3.7 text is provided with this response and is offered as replacement text for the existing petition document text pages.

9. In Appendix C, Part 10, Volume III, ExxonMobil provides the rate data for the various injection wells considered in the demonstration modeling. WDW-397 records were provided at the end of Part 10; however, the Texas Commission on Environmental Quality (TCEQ) forms for WDW-397 listed no injection volume data. ExxonMobil should include the TCEQ forms showing WDW-397's historical injection volumes.

   Response: TCEQ forms showing WDW-397's historical injection volumes are provided with this response and should be inserted in Appendix C-10. The forms cover the period from April 2008 to July 2010. A summary table for the injection rates and volumes injected into WDW-397 has also been prepared and is included with the TCEQ data forms.

10. In Section 7.3.11, Page 7-36, Volume I, ExxonMobil lists a table summarizing historical reservoir brine sample data from area injection wells completed in the Frio E&F, A/B, and C Sands. On Page 7-35, ExxonMobil references the sample analytical reports provided in Appendix C. A comparison of the analytical reports and the summary table indicated numerous discrepancies in the summary table. ExxonMobil should reconcile the table results with the various analytical reports provided in Appendix C.

Response: The discrepancies noted in the table summarizing historical reservoir brine sample data have been corrected. The values reported in the summarizing table were obtained from the petition demonstration provided for the Marisol WDW-147 and WDW-319 injection wells. The summary table prepared by Sandia (Table 2-9 Chemical Analyses of Frio Formation Fluids) and provided in Appendix C-9 should be removed and discarded. Note that additional data are provided in Appendix C for the Dow Hampshire WDW-223 injection well and the Shell WDW-173 injection well. These data were not included in the summary table since the data provided were sufficient for the discussion. Revised Section 7.3.11 text pages are provided with this response and are offered as replacement text for the existing petition document text pages.

11. In Section 7.3.10, Pages 7-34 and 7-35, Volume I, ExxonMobil discusses modeled injection rates including offset injection wells. ExxonMobil discusses that certain offset wells were not included in the demonstration due to location across two faults. ExxonMobil should expand this discussion to also address the extended distances that each of these wells are located from the facility and the level of injection at each of the wells. ExxonMobil should also reference in the discussion any cross sections which demonstrate the structural position of one or more of these injectors in regard to being across the faults from WDW-397 and WDW-398.

Response: The discussion related to the omission of injection effects associated with the operation of WDW-157, WDW-222, WDW-223, WDW-169 and WDW-249 has been expanded to include additional supporting information. Distances to the subject injection wells and recent historical injection rate data have been added to the discussion. Relevant cross-sections are also now referenced in support of the discussion. Revised Section 7.3.10 text pages are provided with this response and are offered as replacement text for the existing petition document text pages. In addition, other information is provided which supports the recent injection rate histories of the subject injection wells. This information should be added to Appendix C-10.

12. In Section 7.3.10, Pages 7-33 through 7-36, Volume I, ExxonMobil references multiple logs of offset injection wells provided in Appendix C. The corresponding injection intervals on these logs were labeled to show correlative Frio interval sands. Several of the logs had incomplete, partially obscured, or missing interval labels. ExxonMobil should review the interval labeling of these logs and replace or add interval labels where needed.

Response: The interval labeling on the subject logs for WDW-36, WDW-147, WDW-162, WDW-169 and WDW-172 has been edited to clarify and/or replace missing interval labels. Replacement logs for the subject injection wells are provided with this response. In addition, appropriately labeled logs for WDW-319, WDW-397 and WDW-398 are included with this response and should be added to Appendix C-9.

13. In Section 7.3.15, Pages 7-48 through 7-50, Volume I, ExxonMobil lists calculations for the various well indices for input to the SWIFT pressure buildup and plume models in all three Frio Sands. EPA obtained different results than shown for all of the well indices. ExxonMobil should confirm the indices calculation results for each sand and determine if any revised model inputs result, if they would impact the demonstration models, and whether or not model reruns are necessary.

Response: The subject well index values provided in Section 7.3.15 are in error and have been corrected. In each case, the corrected well index is higher than the values employed in the demonstration, and are less conservative. With all other parameters being equal, a higher well index value lessens the derived wellbore pressure and brings it closer to the grid block pressure value. A lower well index value has the opposite effect. Although the well index values reported in Section 7.3.15 are in error, they result in conservative wellbore pressure increases. It is therefore not necessary to rerun the models to account for this error. Revised Section 7.3.15 text pages are provided which correct the well index value and indicates that lower well index values were employed to be conservative.

14. In Sections 7.5.1 through 7.5.6, Pages 7-71 through 7-78, Volume I, ExxonMobil discusses the results of 10,000 year plume demonstration modeling, summarizing plume movement distances for both low and high density plumes in the Frio D, E&F, and A/B Sands. ExxonMobil should address the following items concerning the plume model results:

    a. In Section 7.5.1, ExxonMobil references Plate 7-11 for showing the low density Frio D 10,000 year plume boundaries and states that the 10,000 year plume extends 45,700' (assumed to be from WDW-397) updip towards Clinton Dome. Plate 7-11 lists a scale of 1" equals 6000'. A review of Plate 7-11 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm all the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

       Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-11 has been reprinted at the correct scale and is provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

    b. In Section 7.5.2, ExxonMobil references Plate 7-14 for showing the low density Frio E&F 10,000 year plume boundaries and states that the 10,000 year plume extends 37,000' (assumed to be from WDW-397) updip towards Clinton Dome. Plate 7-14 lists a scale of 1" equals 6000'. A review of Plate 7-14 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm all the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

       Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-14 has been reprinted at the correct scale and is provided with this response. The

10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

c. In Section 7.5.3, ExxonMobil references Plate 7-17 for showing the low density Frio A/B 10,000 year plume boundaries and states that the 10,000 year plume extends 40,150' (assumed to be from WDW-397) updip towards Clinton Dome. Plate 7-17 lists a scale of 1" equals 6000'. A review of Plate 7-17 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-17 has been reprinted at the correct scale and is provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

d. In Section 7.5.4, ExxonMobil references Plate 7-20 for showing the high density Frio D 10,000 year plume boundaries and states that the 10,000 year plume extends 38,100' (assumed to be from WDW-397) updip towards Clinton Dome. Plate 7-20 lists a scale of 1" equals 6000'. A review of Plate 7-20 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-20 has been reprinted at the correct scale and is provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

e. In Section 7.5.5, ExxonMobil references Plate 7-22 for showing the high density Frio E&F 10,000 year plume boundaries and states that the 10,000 year plume extends 18,375' from WDW-397 downdip. Plate 7-22 lists a scale of 1" equals 6000'. A review of Plate 7-22 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-22 has been reprinted at the correct scale and is provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

f. In Section 7.5.6, ExxonMobil references Plate 7-24 for showing the high density Frio A/B 10,000 year plume boundaries and states that the 10,000 year plume extends 18,575' from WDW-397 downdip. Plate 7-24 lists a scale of 1" equals 6000'. A review of Plate 7-24 shows a different plume updip migration distance because the bar scale shown on the plate appears closer to 0.9" equals 6000'. ExxonMobil should confirm the 10,000 year plume dimensions listed in the discussion and at the bottom of the plate as well as the map scale shown.

Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plate. Plate 7-24 has been reprinted at the correct scale and is provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct. ?

g. Review all other plates referenced for all Section 7 discussions about 10,000 year plume boundaries and confirm that map scales and plume dimensions shown in the plates are correct and consistent with the corresponding discussion text.

Response: Plate 7-12, Plate 7-15 and Plate 7-18 depict the modeled waste plumes on the Frio D Sand, Frio E&F Sand and Frio A/B Sand isopach maps. The isopach contours on these maps have been revised based on the information obtained during the completion of WDW-398. Revised Plates 7-12, 7-15 and 7-18 are provided with this response as replacements for the existing petition plates. The 10,000-year plume dimensions listed in the discussion and the bottom of the plates were reviewed and are correct.

All plots still 500' on X 300', 400' on Y

Plates 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 7-7, 7-8, 7-9, 7-10, 7-13, 7-16, 7-19, 7-21 and 7-23 were reviewed and found to have the same scaling issue. Each of these Plates were reprinted at the correct scale and are included with this response as replacement text pages.

h. ExxonMobil references plume demonstration model sensitivity runs in Appendix H, Volume X. Plates H-1 and H-2 shows the 10,000 year low density plume extents for the Frio Sands E&F and A/B sensitivity cases in comparison with the plume case results for each sand in Volume I. Each plate lists a scale of 1" equals 6000'. A review of both plates shows different plume updip migration distances because the bar scale shown on both plates appears closer to 0.9" equals 6000'. ExxonMobil should confirm the 10,000 year plume dimensions listed in the sensitivity case discussions and at the bottom of the plates as well as the map scale shown on each plate. ?

Response: During the printing/publication process, "fit to page" options were selected which resulted in scaling down the printed version of the Plates. Plates H-1 and H-2 have been reprinted at the correct scale and are provided with this response. The 10,000-year plume dimensions listed in the discussion and the bottom of the plate were reviewed and are correct.

i. ExxonMobil should address why the plume boundaries for both the 10,000 year low and high density plumes in the Frio D Sand are extremely irregular in shape around the northeast edge on the various Section 7 plates.

Response: The northeast edge of the waste plume for both the 10,000 year low and high density plumes in the Frio D Sand has an irregular shape due to the manner by which the "pinchout" is integrated into the SWIFT model. Plate 4-9 is a net sand isopach map of the Frio D Sand. The Frio D Sand has a net thickness of about 29 feet at the WDW-397 injection well location, about 18 feet at the WDW-398 injection well location, and has an average net thickness value of 30 feet within the end-of-operations waste plume. Just north and east of the ExxonMobil facility location, the Frio D Sand is absent with a net sand thickness of 0 feet. Rather than incorporate a variable thickness into the SWIFT modeling scenario, the net sand of the area of interest was averaged. To account for the absence of the Frio D Sand, the grid cells within the approximate 10-foot thick contour interval line were made inactive via use of the R1-26 Card (FPV=0). A net sand thickness of **25 feet** was selected as a representative thickness of the Frio D Sand interval within the remainder of the modeled area. Within the SWIFT model, at the perimeter of the 10-foot contour line, 25-foot porous rectangular blocks abut rectangular blocks which have no porosity. The porous block fills with the injected waste and follows the "blocky" shape of the rectangular area of the grid cells. Therefore, when plotted, the waste plume outline in the area of concern tends to have a "blocky" outline rather than a smoothed outline.

15. In Section 7.6.1, Pages 7-81 through 7-88, Volume I, ExxonMobil discusses and details calculations and assumptions associated with vertical movement modeling. ExxonMobil also references in the reissuance that the top of the requested (and currently approved) injection interval is at 5900' GL, the top of the requested (and currently approved) injection zone is 5325' GL, the top of the actual completion interval is 6622' GL, and that a requested (and currently approved) upper limit for the completion depth is 6178' GL. Vertical movement calculations were based on a vertical model starting depth of 6178' GL. EPA notes that typically the vertical movement calculations are generally based at or near the top of the injection interval to demonstrate that the injection zone height is sufficient to prevent movement out of zone. Region 6 (R6) agrees that ExxonMobil has demonstrated that the injection zone height is sufficient to contain maximum projected vertical waste movement, 805' through abandoned mud filled wellbores from the demonstration depth, 6178' GL, but not from the injection interval top, 5900' GL. R6 also notes that with the request of an upper completion depth limit, ExxonMobil has limited the effective injection interval top to 6178' GL, but requested an injection interval top 278' higher. ExxonMobil should address the request for excess injection interval footage by clarifying the need for the footage or lowering the requested injection interval top closer to the completion depth limit.

Response: As correctly noted by Region 6, ExxonMobil has demonstrated that the injection zone height is sufficient to contain maximum projected vertical waste movement, 805 feet through abandoned mud filled wellbores from the demonstration depth, 6178 feet GL, but not from the injection interval top, 5900 feet GL. Due to this issue, in lieu of requesting a modification to the top of the Injection Interval (which necessitates a TCEQ Permit amendment and a EPA Petition Reissuance Request), as a condition of the petition authorization, ExxonMobil will stipulate that neither WDW-397 nor WDW-398 will be completed to inject into Injection Interval sands which are higher in the subsurface than 6,178 feet GL in WDW-397 or 6,251 feet GL in WDW-398. The "self-imposed" completion interval limitation effectively meets the intent of the vertical migration guidelines for a no-migration petition demonstration. The modeling section text has been edited to reflect the completion interval depth limitations as specified for both well.

16. In Section 7.6.1.1, Page 7-82, Volume I, ExxonMobil discusses the first 60' of shale overlying the injection interval in determination of vertical movement. ExxonMobil should clarify if this is the first 60' of shale above the upper completion depth limit of 6178' GL and above the Frio D Sand, but still within the injection interval or 60' of shale above the requested injection interval top of 5900' GL.

    Response: The subject text in Section 7.6.1.1 has been edited to clarify the referenced shale thickness. The subject text now reads "The distance, L, and elevation change, Δ z, were both defined as the thickness of the first 60 feet of shale above the upper completion depth limit of 6,178 feet GL (in WDW-397) or 6,251 feet GL (in WDW-398) and above the Frio D Sand." A revised Section 7.6.1.1 is included with this response and is offered as a replacement for the existing petition document text.

17. In Sections 1, 2, and 7, Volume I, ExxonMobil references requested conditions and modeling demonstrations showing injection into the Frio D Sand in either WDW-397 or WDW-398. In earlier discussions with R6 concerning the reissuance, ExxonMobil indicated that it did not plan to complete WDW-398 into the Frio D Sand and, accordingly when the well was completed, the Frio D Sand was not perforated. ExxonMobil should include discussion somewhere in the reissuance clarifying whether or not the Frio D Sand will be used in WDW-398.

    Response: Text has been added to Section 7.2 and Section 7.3.2 which indicates that the Frio D Sand is poorly developed at the location of WDW-398 and that the Frio D Sand was not used in WDW-398. Revised Sections 7.2 and 7.3.2 are included with this response and are offered as a replacement for the existing petition document text.

Section 8 – Area of Review

1. For APs within the area of review (AOR), if they are not deep enough, indicate with "NDE".

    Response: Plate 8-1 has been revised and those artificial penetrations which are within a 2-mile radius which do not penetrate to the Anahuac Marker (marker for the Confining Zone) have been annotated with NDE (not deep enough). A revised Plate 8-1 is provided with the response and is offered as a replacement for the existing Plate 8-1.

2. ExxonMobil will need to update Plate 8-1A, Map Inset Clinton Dome, Oil and Gas Map (Railroad Commission), and Plate 8-2, Area of Review, Oil and Gas Map (Tobin Map), to include the oil and gas wells in the extended plumes to the north of Clinton Dome.

    Response: In order to provide the additional area coverage for Plate 8-1A (scale of 1"=500'), three (3) new plates were prepared (Plates 8-1B, 8-1C and 8-1D). These plates cover the area of the waste plumes to the north, west and northwest of Clinton Dome. Plate 8-2 is a "Tobin Map" at a scale of 1"=500'. Plate 8-1 is a "Tobin Map" at a scale of 1"=2000'. Since Plate 8-1 covers the area of concern, it is not necessary to expand Plate 8-2 across the areas of concern. A revised Plate 8-1A and new Plates 8-1B, 8-1C and 8-1D are provided with this response. Section 8.2.3 has been revised to discuss these added maps. A revised Section 8.2.3 is included with this response and is provided as a replacement for the existing Section 8.2.3 text.

During the review process, an additional artificial penetration was identified on Plate 8-1C which had not been previously identified. The newly identified artificial penetration is labeled as DB-231 and was plugged by filling the well from total depth to surface with cement. A revised Table 8-3 (final page) and DB-231 plugging records are provided with this response and should be appropriately inserted into the petition document.

3. In Section 8.2.3, Page 8-10, Volume I, ExxonMobil references Plate 8-1 as the area of review base map. Plate 8-1 shows the 10,000 year plume boundaries for the low and high density plume cases for each of the three Frio Sands. The 10,000 year low density plume boundary for the Frio D Sand does not appear to agree with the same case plume extent shown on various plates in Section 7. ExxonMobil should confirm that the dimensions of all plume case boundaries on Plate 8-1 are that same as those discussed in Section 7 or clarify why any boundary would be different. Also Plate 8-1 has no legend as to the different symbols and colors used for the different plumes. ExxonMobil will need to address this.

   Response: The various waste plumes drawn on Plate 8-1 were reviewed and compared with the newly revised Section 7 plates (included with this response) and were confirmed to be in agreement. A legend has been added to Plate 8-1 which identifies the various plumes illustrated on Plate 8-1. In addition, the waste plume boundary illustrated on Plate 8-1 is now a composite boundary of the waste plumes which collectively cover the largest area, regardless of the sand horizon. This depiction removes some of the "clutter" from the Plate and allows for easier identification of artificial penetrations within the plume boundary. The revised Plate 8-1 is provided with this response and is offered as a replacement for the existing Plate 8-1.

4. In Section 8.2.3, Page 8-10, Volume I, ExxonMobil references Plates 8-1, 8-1A, and 8-2 as showing AP locations impacted by the 10,000 year plumes in the three Frio Sands. ExxonMobil should include discussion text briefly explaining how the AP locations were designated on the various maps such as "DB" and by AP/map ID number and clarify how AP records in Appendix G, Volume VIII are sorted.

   Response: Additional discussion text has been added to Section 8.2.3 which explains how the AP locations were designated on the various maps such as "DB" and by AP/map ID number. Additional discussion text has been added to Section 8.2.4 which clarifies how AP records in Appendix G, Volume VIII are sorted. Revised Section 8.2.3 and 8.2.4 are included with this response and are offered as replacement text for the existing Section 8.0 text.

5. In Section 8.2.3, Pages 8-12 and 8-13, Volume I, ExxonMobil discusses location and name discrepancies for AP DB-167 on Plates 8-1A and 8-2 and references well records including a scout ticket and Form 8. No well records were found for DB-167 in Appendix G, Volume IX. ExxonMobil should provide the well records for DB-167.

Response: During the reproduction process, well records for DB-167 were inadvertently omitted. In addition, portions of the records for DB-165 thru DB-169 were also omitted. A complete set of the omitted well records are provided with this response. Please remove all records for beginning with DB-165 and ending with DB-169 and insert the well records included with this response.

6. In Section 8.2.5, Pages 8-13 through 8-18, Volume I, ExxonMobil discusses APs in the fixed 2 mile AOR and cone of influence (COI). ExxonMobil should address the following items concerning Section 8.2.5:
   a. On Page 8-15, AP 14 is identified as being plugged with cement plugs and 10.5 lb/gal mud and well records in Appendix G, Volume VIII are referenced. R6 agrees the well is properly plugged to withstand the projected pressure rise at the location; however, the only mud weight legible in the well records was 11.5 lb/gal based on the well's log header. ExxonMobil should clarify what well record indicated that 10.5 lb/gal mud was used in plugging the well.

      Response: A more legible copy of the well log for AP-14 is provided with this response. Based on the log header, 11.5 lb/gal mud was in the well when the depth of 7,300 feet was reached and 12.3 lb/gal mud was in the wellbore when the well reached the total depth of 8,328 feet. A copy (more legible) of the log header is provided with this response, along with a revised copy of the schematic drawing for AP-14. Based on this information, the information in Section 8.2.5 concerning AP-14 was revised and now cites a mud weight of 12.3 lb/gal. A revised Section 8.2.5 is included with this response and is provided as a replacement for the existing Section 8.2.5 text.

   b. On Page 8-16, AP 16's allowable pressure rise is calculated with the AP's location listed as corresponding to pressure buildup model cell 79, 14 with a grid block center depth of 6540' below mean sea level (MSL). A review of the pressure buildup model input file, EXMOB_Dprs_A.dat, in Appendix E-1, Volume V shows that cell 79,14 has a grid block center depth of 6439.5' MSL depth. ExxonMobil should confirm the correct corresponding cell grid block center depth and make appropriate revisions to the allowable pressure buildup calculation as needed.

      Response: The subject error has been corrected. The rounded up number of 6,440 feet MSL is correct and appropriate revisions were made to the allowable pressure buildup calculation for AP-16. A revised Section 8.2.5 is included with this response and is provided as a replacement for the existing Section 8.2.5 text.

7. In Section 8.2.7, Pages 8-22 through 8-42, Volume I, ExxonMobil discusses APs within the 10,000 year modeled plume boundaries. ExxonMobil should address the following items concerning APs within 10,000 year plume boundaries:
   a. The log header for DB-184 is illegible and did not clearly identify the well name on it. If available, ExxonMobil should provide a more legible copy of the log header showing the actual well name.

      Response: An attempt was made to locate a more legible copy of the DB-184 log header. Another copy of the log was acquired from TGS Log-Line. The header information is still obscured; however, TGS Log-Line has added header information at the beginning of the log. The log header and TGS Log-Line information is provided with this response. The enclosed DB-184 log header should be added to Appendix G.

b. The discussion for DB-201 referenced plugging records; however, no plugging records were found for the AP in Appendix G, Volume IX. ExxonMobil should provide the plugging records referenced in the discussion.

Response: During the reproduction process, well records for DB-201 were partially omitted. In addition, portions of the records for DB-202 thru DB-204 were also omitted. A complete set of the omitted well records are provided with this response. Please remove all records for beginning with DB-201 and ending with DB-204 and insert the well records included with this response.

c. The discussion for DB-204 referenced a scout ticket and an electrical log; however only lease map copies were found for the AP in Appendix G, Volume IX. ExxonMobil should provide the scout ticket and an electrical log header.

Response: During the reproduction process, well records for DB-204 were partially omitted. In addition, portions of the records for DB-201 thru DB-203 were also omitted. A complete set of the omitted well records are provided with this response. Please remove all records for beginning with DB-201 and ending with DB-204 and insert the well records included with this response.

8. In Section 8.3, Pages 8-43 through 8-45, Volume I, ExxonMobil discusses historical well plugging requirements for Texas, listing required mud weights for 1919-1934, 1934-1967, and 1967 to present eras and referencing Appendix D17, Volume IV as containing copies of pertinent portions of the Railroad Commission of Texas (RRC) (2000) and Schultz (1984) publications supporting historical plugging requirements from 1899 to the present era. ExxonMobil lists the RRC's requirements for plugging mud weights of 10.5 lb/gal for 1919-1934, 10 lb/gal for 1934-1967, and 9.5 lb/gal for 1967 to present eras. Plugging requirements appeared to be generally explained in these rule documents under "manner of plugging." ExxonMobil should address the following items concerning the historical plugging practice documents in Appendix D17:

   a. In Appendix D17, the historical document titled "History of The Railroad Commission's Plugging Regulation for the Protection of Usable Quality Ground Water" by Schultz included only copies of every even-numbered pages from page 2 through 10 (an appendix title page) and presented an incomplete listing of Rule 9 for 1919 rules on its Page 4 with manner of plugging information. ExxonMobil should provide the odd-numbered pages which include the remainder of Rule 9, provide the appendix following the appendix title page on Page 10 if relevant, and confirm that the cited 10.5 lb/gal mud weight for 1919 era plugging is demonstrated by the document.

   Response: During the reproduction process, the reproduction company failed to copy the backside of the double-sided document, hence the missing pages. A complete copy of the "History of The Railroad Commission's Plugging Regulation for the

Protection of Usable Quality Ground Water" by Schultz is provided with this response. The June 18, 1919 Rule 9(b) states that the mud-laden fluid used to plug the well "shall weigh at least 25 per cent more than an equal volume of water". On Page 5 of the document, Schultz basically restates Rule 9(b) and indicates that "the well should have been plugged by the mud laden method with a mud weighing 25% more than water (10.5 ppg)." The discussion in Section 8.3 was edited to specifically relay the language from Rule 9(b). A revised Section 8.3 is included with this response and is provided as a replacement for the existing Section 8.3 text.

b. A second Appendix D17 document, Oil and Gas Circular No. 16-8 for 1934 rules, included Pages 8, 9, 12, and 13 and referenced an unprovided appendix under manner of plugging details on Page 9. ExxonMobil should include Pages 10 and 11 for the document and the unlisted appendix if relevant and confirm that the cited 10 lb/gal mud weight for 1934 era plugging is demonstrated by the document. Rule 17 in the document references a mud weight of 9.5 lb/gal.

Response: During the reproduction process, the reproduction company failed to copy the backside of the double-sided document, hence the missing pages. A complete copy of the "History of The Railroad Commission's Plugging Regulation for the Protection of Usable Quality Ground Water" by Schultz is provided with this response. The May 15, 1934 Rule 10(b) refers the reader to an attached appendix included as part of the Oil and Gas Circular No. 16-B for 1934 rules. The subject appendix occurs later in the document on Page 21 (note page number added to upper right corner of page). The "Instructions to Deputy Supervisor Dated February 1, 1934" confirms the cited 10 lb/gal mud weight for 1934 era plugging.

c. Another document copy in Appendix D17, Oil and Gas Circular No. 7 for 1919 rules, started with Rule 14 and did not appear to detail manner of plugging information. Rule 17 in the document references a mud fluid density of not less than 25 percent for a well drilled into oil and gas producing strata. ExxonMobil should include a copy of the manner of plugging information or its equivalent as shown in this circular and confirm that the cited 10.5 lb/gal mud weight for 1919 era plugging is demonstrated by the document.

Response: A complete copy of the "History of The Railroad Commission's Plugging Regulation for the Protection of Usable Quality Ground Water" by Schultz is provided with this response. The June 18, 1919 Rule 9(b) states that the mud-laden fluid used to plug the well "shall weigh at least 25 per cent more than an equal volume of water". On Page 5 of the document, Schultz basically restates Rule 9(b) and indicates that "the well should have been plugged by the mud laden method with a mud weighing 25% more than water (10.5 ppg)." The discussion in Section 8.3 was edited to specifically relay the language from Rule 9(b). A revised Section 8.3 is included with this response and is provided as a replacement for the existing Section 8.3 text.

INJECTION WELL NO-MIGRATION PETITION RE-ISSUANCE FOR WDW-397 AND WDW-398

VOLUME I

Text, Tables, Figures and Plates

Prepared for

ExxonMobil

Prepared by

TERRA
DYNAMICS INC
ENVIRONMENTAL SERVICES

AUSTIN, TEXAS

Project No. 09-104
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TERRA DYNAMICS INC

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